



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/520,915	01/07/2005	Satoshi Mizutani	3712174.00491	5221
29175	7590	11/09/2010		
K&L Gates LLP P. O. BOX 1135 CHICAGO, IL 60690				
EXAMINER				
CHUO, TONY SHENG HSIANG				
ART UNIT		PAPER NUMBER		
1729				
NOTIFICATION DATE		DELIVERY MODE		
11/09/2010		ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

chicago.patents@klgates.com

Office Action Summary

Application No.

10/520,915

Applicant(s)

MIZUTANI ET AL.

Examiner

Tony Chuo

Art Unit

1729

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 August 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 41, 44, 45, 47-63, 66, 67 and 69-88 is/are pending in the application.
- 4a) Of the above claim(s) 50-62 and 72-80 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 41, 44, 45, 47-49, 63, 66, 67, 69-71 and 81-88 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Proficiency's Patent Drawing Review (PTO-544)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. Claims 41, 44, 45, 47-63, 66, 67, and 69-88 are currently pending. Claims 1-40, 42, 43, 46, 64, 65, and 68 are cancelled. New claims 87 and 88 have been added. Claims 50-62 and 72-80 are withdrawn from further consideration as being drawn to a non-elected invention. The amended claims do not overcome the previously stated 103 rejections. Therefore, upon further consideration, claims 41, 44, 45, 47-49, 63, 66, 67, 69-71, and 81-88 are rejected under the following double patenting and 103 rejections.

Double Patenting

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

3. Claim 63 is provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 10 and 16 of copending Application No. 11/267,641. Although the conflicting claims are not identical, they are not patentably distinct from each other because the subject matter of claim 63 is fully anticipated by the claims of copending Application No. 11/267,641.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

4. Claims 41 and 63 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-3, 9-11, 18, 19, 26, and 27 of copending Application No. 12/026,594. Although the conflicting claims are not identical, they are not patentably distinct from each other because the subject matter of claims 41 and 63 is fully anticipated by the claims of copending Application No. 12/026,594.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

5. Claims 41, 49, 63, and 71 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 2, 7, and 8 of copending Application No. 11/268,010. Although the conflicting claims are not identical, they are not patentably distinct from each other because the subject matter of claims 41, 49, 63, and 71 is fully anticipated by the claims of copending Application No. 11/268,010.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

6. Claims 41 and 63 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-3 and 10-12 of copending Application No. 11/225,540. Although the conflicting claims are not identical, they are not patentably distinct from each other because the subject matter of claims 41, 42, 63, and 64 is fully anticipated by the claims of copending Application No. 11/225,540.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 41, 49, 63, 71, 81, 82, 84, 85, 87, and 88 are rejected under 35 U.S.C. 103(a) as being unpatentable over Turner et al (US 6203944).

Regarding claims 41 and 63, the Turner reference discloses a battery comprising: a cathode, an anode, and an electrolyte, wherein the anode (anode mixture layer) comprises an anode material having a reaction phase containing tin (element capable of generating an intermetallic compound with lithium), iron, and graphite

(carbon) (col. 6, lines 28-32, col. 16, lines 29-32 and Examples 17 and 19), wherein specific examples of the anode material include 6 wt% graphite (carbon) and 7.2 wt% graphite (carbon) in the reaction phase (Examples 17 and 19).

However, Turner et al does not expressly teach a ratio of carbon in the reaction phase that ranges from about 10% by weight to about 40% by weight.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Turner anode to include a ratio of carbon in the reaction phase that ranges from about 10% by weight to about 40% by weight because even if the range of prior art and the claimed range do not overlap, obviousness may still exist if the ranges are close enough that one would not expect a difference in properties (*In re Woodruff* 16 USPQ 2d 1934 (Fed. Cir. 1990)).

Examiner's note: It is the position of the examiner that 7.2 wt% carbon is close enough to 10 wt% carbon that one of ordinary skill in the art would not expect a difference in properties. In addition, there is no evidence of the criticality of the claimed range of carbon ratio in the reaction phase. In addition, it is the position of the examiner that the property "A peak of carbon that is obtained in a region lower than about 284.5 eV by x-ray photoelectron spectroscopy" is an inherent property of the Turner anode because Turner et al discloses the same anode materials with similar compositions as the anode material recited in claims 41 and 63 of the present invention. Further, it is inherent that carbon in the reaction phase exists among tin and is bonded to form a carbide with iron (metal element) contained in the reaction phase such that the electric charge density of the carbon in the reaction phase is increased by interaction with iron

(metal element) because Turner discloses the same anode materials (tin, iron, carbon) that are prepared by the same process of ball milling (Example 17 and 19). The specification of the present application discloses "at least one of the lithium active elements and carbon are alloyed to synthesize the anode material" and "For this mechanical alloying, for example, a planet ball mill device ... can be used" (pg. 13, lines 9-12).

Regarding claims 49 and 71, it also discloses crystal sizes of less than about 500 angstrom ($0.05\ \mu\text{m}$) (col. 5, lines 7-11).

Regarding claims 81, 82, 84, and 85, it also discloses an anode mixture layer comprising 8 wt% carbon black (carbonaceous material capable of inserting and extracting lithium) (col. 16, lines 29-33).

Regarding claims 87 and 88, it is the position of the examiner that a peak of carbon obtained in a region greater than 282.5 eV and lower than about 284.5 eV by X-ray photoelectron spectroscopy is an inherent property of the Turner anode because Turner discloses the same anode materials (tin, iron, carbon) with similar compositions as the anode materials recited in claims 41 and 63 of the present invention. In addition, Table 1-6 of the specification of the present application discloses an example (Example 1-23) comprising Sn (tin), Fe (iron), and carbon, that has a XPS C1s peak of 283.8 eV.

9. Claims 41, 45, 47-49, 63, 67, 69-71, 81, 82, 84, 85, 87, and 88 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kohno et al (US 6495291) in view of Kawakami et al (JP 2000-311681).

Regarding claims 41, 45, 63, and 67, the Kohno reference discloses a non-aqueous secondary battery comprising a positive electrode (cathode), a negative electrode (anode), and a non-aqueous electrolyte, wherein the negative electrode comprises 70 to 95% by weight of negative electrode active material (col. 9 lines 11-22), wherein the negative electrode active material comprises a composition that is $M1_xM2_yC_{1-x-y}$, wherein x and y are atomic ratios, wherein M1 is at least one element selected from the group consisting of Si, Ge, Sn, Pb, B, Al, Ga, In, Sb, and Zn, wherein M2 is at least one element selected from Mg, Ca, Sr, Ba, Ti, Zr, V, Ta, Cr, Mo, and W, wherein an example of the negative electrode active material shown in Table 1 is $Sn_{0.25}Mg_{0.03}C_{0.72}$ which corresponds to 22.1 wt% carbon when the atomic ratios are converted to weight percent (col. 4 line 18 to col. 5 line 3, and Table 1, Example 1). Examiner's note: Ti, Zr, V, Ta, Cr, Mo, and W are elements from Group 4 to Group 6 in a long period periodic table.

However, Kohno et al does not expressly teach a reaction phase that contains at least one constituent selected from the group consisting of nickel, copper, iron, cobalt, manganese, zinc, indium, and silver (claims 41 and 63). The Kawakami reference discloses a negative electrode material for a lithium secondary battery containing particles having a composition expressed by formula $Sn.A.X$, wherein A is at least one kind of transition metal chosen from Cr, Mn, Fe, Co, Ni, Cu, Mo, Tc, Ru, Rh, Pd, Ag, Ir, Pt, Au, Ti, V, Y, Sc, Zr, Nb, Hf, Ta, and W, wherein X is at least one kind selected from a group comprising O, F, N, Mg, Ba, Sr, Ca, La, Ce, Si, Ge, C, P, B, Bi, Sb, Al, In, S,

Se, Te, and Zn, wherein examples of the negative electrode material are Sn-Ni-C, Sn-Fe-C, Sn-Cu-C, Sn-Co-C, Sn-Fe-Ni-C (See Abstract and paragraphs [0033],[0099]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Kohno negative electrode active material by substituting the elements of M2 for at least one constituent selected from the group consisting of nickel, copper, iron, cobalt, manganese, zinc, indium, and silver in order to utilize elements that provide an electrode structural body capable of contributing to a lithium secondary battery having a long cycle life, high capacity, and high energy density (See Abstract). In addition, the substitution of one known M2 element for another would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Examiner's note: It is the position of the examiner that the property "A peak of carbon that is obtained in a region lower than about 284.5 eV by x-ray photoelectron spectroscopy" is an inherent property of the Kohno/Kawakami anode material because Kohno et al as modified by Kawakami et al discloses the same anode materials with same compositions as the anode materials recited in claims 41 and 63 of the present invention. In addition, it is inherent that carbon in the reaction phase exists among tin and is bonded to form a carbide with metal element contained in the reaction phase such that the electric charge density of the carbon in the reaction phase is increased by interaction with metal element because Kohno et al discloses anode materials that are formed by the same mechanical processing using a planetary ball mill (col. 15, lines 20-24). The specification of the present application discloses "at least one of the lithium

active elements and carbon are alloyed to synthesize the anode material" and "For this mechanical alloying, for example, a planet ball mill device ... can be used" (pg. 13, lines 9-12).

Regarding claims 47 and 69, it is inherent that anode material particles with a particle diameter within a range of between $0.1\ \mu\text{m}$ and $50\ \mu\text{m}$ has a specific surface area of the anode material that ranges from about $0.05\ \text{m}^2/\text{g}$ to about $70\ \text{m}^2/\text{g}$.

Regarding claims 48 and 70, Kohno et al also discloses that the particle diameter of the composite material that is within a range of between $0.1\ \mu\text{m}$ and $50\ \mu\text{m}$ (col. 8, lines 27-29).

Regarding claims 49 and 71, Kohno et al also discloses an average size of the crystal phase that is within a range of between $0.03\ \mu\text{m}$ and $8\ \mu\text{m}$ (col. 6, lines 37-40).

Regarding claims 81, 82, 84, and 85, Kohno et al also discloses a negative electrode comprising 0 to 25% by weight of a conductive agent such as graphite (carbonaceous material capable of inserting and extracting lithium) (col. 9, lines 11-21).

Regarding claims 87 and 88, it is the position of the examiner that a peak of carbon obtained in a region greater than $282.5\ \text{eV}$ and lower than about $284.5\ \text{eV}$ by X-ray photoelectron spectroscopy is an inherent property of the Kohno/Kawakami anode material because Kohno et al as modified by Kawakami et al discloses the same anode materials ($\text{Sn}+(\text{Ni}, \text{Cu}, \text{Fe}, \text{Co}, \text{Mn}, \text{or Ag})+\text{carbon}$) with the same compositions as the anode materials recited in claims 41 and 63 of the present invention. In addition, Table 1-6 of the specification of the present application discloses examples comprising the same anode materials that all have a XPS C1s peak of $283.8\ \text{eV}$.

10. Claims 44 and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kohno et al (US 6495291) in view of Kawakami et al (JP 2000-311681) as applied to claims 41 and 63 above. In addition, Kawakami also discloses a negative electrode material that contains an alloy of tin, cobalt, carbon, and a fourth element (Table 11, sample no. 20). It also discloses an element X of the alloy that is at least one kind selected from O, F, N, Mg, Ba, Sr, Ca, La, Ce, Si, Ge, C, P, B, Bi, Sb, Al, In, S, Se, Te, and Zn (See Abstract).

However, Kohno et al as modified by Kawakami et al does expressly teach a reaction phase that contains at least one selected from the group consisting of zinc, indium, and silver.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to try to form an alloy from a finite number of identified alloying elements that are used in anode active materials with a reasonable expectation of success such as long cycle life, high capacity, and high energy density.

11. Claims 83 and 86 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kohno et al (US 6495291) in view of Kawakami et al (JP 2000-311681) as applied to claims 41 and 63 above.

However, Kohno et al as modified by Kawakami et al does expressly teach a carbonaceous material capable of inserting and extracting lithium in about equal ratio with the anode material.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Kohno/Kawakami negative electrode to include a

carbonaceous material capable of inserting and extracting lithium in about equal ratio with the anode material because changes in proportions was held to be obvious (*In re Fields* 134 USPQ 242 (CCPA 1962); *In re Reese* 129 USPQ 402 (CCPA 1961)). In addition, there is no evidence of criticality of the ratio of carbonaceous material to anode material.

Response to Arguments

12. Applicant's arguments filed 8/20/10 have been fully considered but they are not persuasive.

The applicants argue that Turner fails to disclose or suggest that the carbon in the reaction phase exists among the tin and is bonded to form a carbide with a metal element or metalloid element contained in the reaction phase such that the electric charge density of the carbon in the reaction phase is increased by interaction with the metal element or metalloid element, as recited in amended Claims 41 and 63.

In response, as stated above, Turner discloses the same process of ball milling tin, iron, and carbon which inherently bonds carbon to iron (metal element) to form a carbide. Therefore, an increase in the electric charge density of carbon in the reaction phase is an inherent property of the Turner anode material.

The applicants further argue that Kohno fails to disclose or suggest that the carbon in the reaction phase exists among the tin and is bonded to form a carbide with a metal element or metalloid element contained in the reaction phase such that the

electric charge density of the carbon in the reaction phase is increased by interaction with the metal element or metalloid element, as recited in amended Claims 41 and 63.

In response, as stated above, Kohno discloses the same mechanical processing using a planetary ball mill which inherently bonds carbon to a metal element to form a carbide. Therefore, an increase in the electric charge density of carbon in the reaction phase is an inherent property of the Kohno/Kawakami anode material.

The applicants further argue that Kawakami has a very large list of possible elements and provides no guidance as to what, if any, added elements are beneficial for long life cycle, high capacity or high energy density.

In response, the examiner maintains the contention that one skilled in the art would know that the X elements listed would contribute to a battery having long cycle life, high capacity, and high energy density. In addition, the applicants have not provided any evidence of non-obviousness of choosing an element from a finite list of known alloying elements.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571)272-0717. The examiner can normally be reached on M-F, 9:00AM to 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ula Ruddock can be reached on (571) 272-1481. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC

/Ula C Ruddock/
Supervisory Patent Examiner, Art Unit 1795